REMARKS

This paper is responsive to an *Official Action* that issue in this case on November 19, 2007. In that *Action*, the Examiner finalized a restriction requirement, thereby withdrawing claims 19-28 from consideration. Furthermore, the Examiner rejected claims 1-18 under 35 USC §103 as being obvious over U.S. Published Patent Application 2005/0146985 to Doolan.

In addition to applicant's remarks here traversing the Section 103 rejection, claim 10 has been amended and claim 11 has been canceled.

Rejections Under 35 USC §103

The Examiner rejected the claims over Doolan. Doolan is directed to an underwater communications station capable of transmitting and receiving signals in an acoustic positioning system.

Doolan discloses a tracking system having underwater station (1) that is positioned on the ocean floor and beacon (2) that is tethered to the station. The beacon (2) has two transmitters (14) and (16), one of which transmits to a floating ship and the other of which transmits to station (1). (*See*, Doolan, *e.g.*, at FIGs. 1 and 3.)

Since the beacon is tethered, it is free to move with ocean currents. This is problematic because the beacon's position must be precisely known. Since the position of station (1) is known, and the relative position of beacon (2) is known (*i.e.*, relative to station (1)), the precise position of the beacon can, in fact, be determined.

The position of beacon (2) is determined in conjunction with four receiving hydrophones (12) that are disposed on transducer ring (34), which is coupled to chassis (3) of station (1). (*See*, *e.g.*, FIGs. 6-8.)

According to Doolan, a calibration procedure must be performed wherein the acoustic center of each of the four receiving hydrophones (12) is calculated. Doolan discloses that the acoustic center of receiving hydrophones (12) may vary with bearing, azimuth angle, and frequency. Therefore, according to Doolan, the acoustic center of the hydrophones should be determined for all permutations of those parameters. (*See*, para. 0062.)

The calibration procedure is disclosed at paragraph [0063]. The procedure involves determining the acoustic center of the hydrophones for all bearing angles (1 to 360 degrees), all relevant frequencies (66 kHz to 96 kHz), and all relevant azimuth angles (from 45 degrees above the horizontal plane to vertical). In this fashion, the acoustic center of

each receiving hydrophone is obtained for all possible scenarios. This information is then stored in a look-up table. As a consequence, even though the orientation of beacon (2) is constantly changing relative to station (1) due to the action of ocean currents, the "correct" acoustic center is always available for use in position calculations.

Two things should be apparent when comparing Doolan with applicant's claimed invention:

1. There is no disclosure in Doolan of *how* the acoustic center is actually calculated.
2. There is no disclosure in Doolan concerning the theoretical center of a hydrophone.

Regarding point (1), the "*how*" (as in how to calculate the acoustic center) is a key aspect of applicant's claimed invention. For example, for a transducer having a plurality of transducing elements, claim 2 teaches that the acoustic center is determined by "ensonifying each of said transducing elements, one transducing element at a time." Amended claim 10 provides additional teaching regarding the manner in which the acoustic center is determined:

(a) measuring a response characteristic of each transducing element in said transducer; and

(b) calculating a weighted average of said response characteristic of each transducing element as a function of a location of said transducing element relative to other of said tranducing elements in the transducer.

Regarding "*how*," Doolan simply notes that "[t]he time of arrival of the signal of each of the four receiving hydrophones (12) is then measured." It is also clear that Doolan ensonifies all four receiving hydrophones (12) at the same time. Contrast this with applicant's invention wherein specific transducing elements within a transducer are ensonified element by element.

Regarding point (2), there is nothing about Doolan's system or method that necessitates consideration of the "theoretical" center of a hydrophone. Doolan teaches measuring the acoustic center of the receiving hydrophones to calculate a measurement baseline. This baseline is determined for a specific bearing, azimuth angle, and frequency. To account for the affect that a change in any one or more of these three parameters will have on the acoustic center of hydrophones (12), a pre-constructed look-up table is consulted. The look-up table includes the actual (*i.e.*, measured) acoustic center of the hydrophones as a function of a change in any one or more of the three parameters. (*See*, *e.g.*, paras. [0063] – [0064].) Doolan is not concerned with the theoretical center of the hydrophone because

Doolan's method utilizes the *actual* acoustic center of the hydrophones for any and all calculations.

Turning now to the specifics of the claim language:

Claim 1 recites:

> determining an acoustic center of a transducer, wherein said transducer has a plurality of transducing elements; and
>
> determining an offset of the determined acoustic center from a theoretical acoustic center.

Doolan does not disclose (or suggest) what is recited in claim 1. Namely, Doolan does not disclose "determining an offset of the determined acoustic center from a theoretical acoustic center." As previously discussed, there is nothing about Doolan's invention or disclosure that even remotely implicates a consideration of the theoretical acoustic center of a hydrophone.

As a consequence, claim 1 is believed to be allowable over Doolan. Based on their dependence of claim 1, claims 2-9 are likewise believed to be allowable. Furthermore, the recitation of additional patentable features in the dependent claims provides a secondary basis for their patentability.

Amended claim 10 recites a method comprising:

> determining an acoustic center of each of a plurality of transducers, wherein each transducer has a plurality of transducing elements, and wherein the acoustic center of each of said transducers is determined by:
>
> (a) measuring a response characteristic of each transducing element in said transducer; and
>
> (b) calculating a weighted average of said response characteristic of each transducing element as a function of a location of said transducing element relative to other of said transducing elements in the transducer.

Doolan does not disclose (or suggest) what is recited in claim 1. Namely, Doolan does not disclose that the acoustic center of each transducer in a plurality thereof is determined via "measuring a response characteristic of *each transducing element*" in the transducer and "calculating a weight average of said response characteristic of each transducing element as

a function of a location of said transducing element relative to other of said transducing elements in the transducer."

As a consequence, claim 10 is believed to be allowable over Doolan. Based on their dependence of claim 10, claims 12-16 are likewise believed to be allowable. Furthermore, the recitation of additional patentable features in the dependent claims provides a secondary basis for their patentability.

Claim 17 recites a method comprising:

> calculating an acoustic center of each of a plurality of multi-element transducers;
>
> calculating an offset for each of said plurality of multi-element transducers, wherein said offset is based on said calculated acoustic center and a theoretical acoustic center of each of said multi-element transducers; and
>
> correcting signal processing calculations using said offsets.

Doolan does not disclose (or suggest) what is recited in claim 17. Namely, Doolan does not disclose calculating an offset for each multi-element transducer, wherein the offset is based on the difference between the calculated and theoretical acoustic center of each transducer. Nor does Doolan suggest using the offset to correct signal processing calculations.

As a consequence, claim 17 is believed to be allowable over Doolan.

Claim 18 recites a method for use with a transducer array, wherein the method comprises:

> modifying signal-processing calculations to compensate for an offset between a theoretical acoustic center of said transducer array and an actual acoustic center of said transducer array.

As previously discussed, Doolan does not disclose or otherwise suggest modifying signal-processing calculations to compensate for an offset between a theoretical acoustic center of a transducer array and an actual acoustic center of the transducer array.

As a consequence, claim 18 is believed to be allowable over Doolan.

Conclusion

In view of the foregoing, claims 1-10 and 12-18 now presented for examination are believed to be in condition for allowance. A notice to that effect is solicited.

Respectfully,
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